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ABSTRACT

This report describes environmental training in the Federal Republic of Germany, confined to that provided in vocational schools and industrial establishments. It also covers the further training of environmental trainers in such establishments. Following an introduction (Chapter I), Chapter II outlines the politico-educational background of job-related environmental studies. The next four chapters (Chapters III-VI), examine the integration of environmental protection into four training sectors by means of examples or case studies, referring also to the organizational context in each case. These chapters focus on environmental studies in on-the-job training, environmental studies in the further training of training personnel, environmental training in technical colleges, and environmental training in further training for teachers. Chapter VII maps out perspectives for the improvement of environmental training in the sectors examined, on the basis of the programs described and of the current debate on environmental training. (Sixty endnotes are appended.) (YLB)

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I. Introduction

The purpose of this report is to describe environmental training in the Federal Republic of Germany, confined to that provided in vocational schools and industrial establishments. It will also cover the further training of environmental trainers in such establishments. The study will be limited to the basic vocational training in the dual system.

Training under the dual system involves two learning environments. It is provided in firms on the basis of civil law agreements and federal acts, as well as in vocational training establishments on the basis of educational laws of the various Federal Länder. This gives rise to specific elements of particular significance to the integration of environmental protection into vocational training. We shall go into this in greater detail later in this report.

We must first establish what skills related to environmental protection are considered necessary within the context of initial vocational training in Germany, and to what extent they are actually taught, and how they are taught, on the job and in training establishments. Then we must examine the form and conditions of further training in this field for institutional and on-the-job training personnel. We shall consider only those further training programmes that are specifically designed for trainers and vocational school teachers. Other environmental training and further training opportunities are outside the scope of this report.

There have been a number of official announcements and declarations of intent, but so far there has been no adequate progress evaluation of the new and constantly expanding field of job-related environmental training. The less than three-month time-span allotted for the completion of this report was somewhat too short to undertake a representative survey on the integration of environmental protection. We were obliged, therefore, to fall back on examples with which we were familiar, to describe them in the form of case studies and examine them in the context of the current debate on training policy. Our experience in the field of job-related environmental training was particularly useful here.

We opted for cases where the declared aim was to integrate environmental protection into training and further training, concentrating primarily on the training required in a few specific industrial occupations, in order to ensure at least a measure of comparability in the examples. As far as we can judge from the available literature on the subject, these are typical, if not standard-setting examples.

We have applied the following methodology in compiling this report:

- examination and analysis of available literature;
- interviews (some by telephone) with persons responsible for training (trainers, further trainers, vocational school teachers and one environmental consultant);
- inspection of training workshops;
- analysis of documentation (training regulations, teaching curricula, further training programmes, project descriptions, business reports etc.).

The report is divided into the following sections: First we outline the politico-educational background of job-related environmental studies. In the subsequent four chapters we shall examine the integration of environmental protection into four training sectors by means of examples, referring also to the organisational context in each case. In conclusion, we shall map out perspectives for the improvement of environmental training in the sectors examined, on the basis of the programmes described and of the current debate on environmental training.

II. Politico-educational background of job-related environmental studies

As early as 1971 the Federal Government's environmental programme[1] stressed the need to promote environmental awareness in on-the-job and institutional vocational training. No increased activity in the field of environmental training was registered until environmental policy became a separate policy issue, i.e. the early eighties.

Particularly worthy of mention in this context are the statement of the Länder Ministers of Education and the Arts in 1980 concerning the school's role in enviromental education, and the 1986 symposium on "Environmental Training - a mission for the future", with which the Federal Minister of Education and Science (BMBW) began to devote greater attention to this aspect of education. In 1987, the Federal and Regional Commission for educational planning and research promotion (BLK = Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung) introduced a project to include environmental issues in education.[2] A major impetus was provided by the Federal Institute for Vocational Training (BIBB), which set up a research project for "Skills Requirements and Training in Environment Protection". The project develops materials for on-the-job training in environmental protection and programmes and materials to reinforce the further training of environmental training personnel, as well as exploring new fields of occupational activity specifically related to environmental protection. The pilot experimental project "Environment Protection in Vocational Training" monitors 11 industrial pilot schemes (in existence in January 1992), in which programmes, methods, materials and media for the integration of environment protection in training and further training are being developed and tested.[3] Since 1991, the BMBW has been promoting projects for the training of environmental training personnel in vocational training establishments especially in the new German provinces.[4]

The report of the German Parliamentary Survey Commission "Future educational policy - education in the year 2000"[5] and the recommendations of a group of experts appointed by the BMBW to implement the recommendations of the Survey Commission on "Preventive Measures to Protect the Earth's Atmosphere"[6] within the training system are of special significance from the point of view of objectives to be attained.

The view that environmental training is essential if the future viability of modern industrial society is to be ensured is gradually acquiring acceptance and increasing support in Germany. Those involved in vocational education are in agreement that every occupation affects the environment - albeit to varying degrees. Environmental protection skills should therefore be taught in the course of training for every occupation - this applies to both the institutional and on-the-job components of training. Environment-related skills are often seen as core or basic skills in this context. By contrast, new, separate skilled occupations in environmental protection are destined to remain the exception, to be created when areas of responsibility in the field of environmental protection cannot be covered by existing skilled occupations. One such recognised skilled occupation exists at present in Germany - that of waste management and disposal technician.

The situation is somewhat different in the field of further training, where regional initiatives and informal standards have to some extent led to the creation of new professions, which may or may not be subsequently officially recognised by the competent professional associations and/or the Federal Government.

One example of this is the "environmental consultant in craft trades" (Hamburg trade corporation). On the whole, the emergence of new environment-related occupations is also treated with reserve in the field of further training.[7]

At a general level, at least, there is also consensus in Germany concerning the objectives of environmental training. Environmental training should go beyond mere reactive compliance with government standards and requirements. It is not solely a matter of teaching the job-related knowledge and skills, e.g. legal requirements or the "correct" handling of substances and appliances. Analytical skills must also be taught, such as how to recognise ecological correlations and the effects of job-related activity on the environment. In particular, however, environmental training should promote environmental awareness among working persons and lead them to adopt a responsible attitude to nature. Above all, it should lead them to greater respect for the environment in the activities associated with their jobs.

Opinions differ as to the extent to which certain job-related and industrial activities and industrial infrastructures that harm the environment should be discontinued in the interest of widening the field of ecological action and decision-making. There is, however, agreement in principle that environment-oriented training for workers is impossible unless appropriate conditions are set in place, i.e. technical and organisational environmental protection measures in industry. The reverse also applies: technical and organisational environmental protection measures in industry require the co-operation and acceptance of the workers if they are to be implemented.

Nobody disputes the fact that environmental skills cannot be taught through the traditional forms of vocational education. Teaching and learning processes should be designed in such a way that didactic criteria such as involvement, integrity, associative thinking and co-ordinated action should be taken into consideration as much as initiative-promoting learning methods. What is needed is the co-operation of different learning centres and the participation of environmental experts from within and outside the enterprise[8]

III. Environmental studies in on-the-job training

A. Present situation

Since the end of the seventies, environmental protection has been increasingly integrated into vocational training regulations. These constitute the legal basis for the practical on-the-job component of vocational training. Environmental protection is integrated by being included in the job outline for the occupation envisaged. Thus, for example, the job outline for the industrial metal and electrical engineering occupations, reclassified in 1987, lists "occupational safety, environmental protection and the rational use of energy". The skills and knowledge to be imparted throughout the entire training programme (involving independent planning, implementation and monitoring) are formulated under this heading. The following learning objectives are included in the training of industrial mechanics:

- "to know the principal regulations applying to the enterprise providing the training, concerning prevention of gas emissions, prevention of water and air pollution,
- to know job-related sources of pollution and help to reduce them,
- to know the types of energy used in the enterprise providing the training and to indicate possibilities for a rational use of energy within the job-related field of influence and observation".[9]

This wording, with slight variations, is to be found in the regulations for other industrial metal and electrical engineering occupations, though, in the latter category, there is no mention of knowledge of statutory regulations.[10]

These relatively general requirements find concrete expression as to time and content, only rarely, if at all, in vocational training regulations. On the other hand, a number of environment-related issues are implied, i.e. not expressly stated, in training regulations, often in connection with occupational safety. An example of this would be the correct maintenance of plant in the metal industry. Since questions on environmental issues - though part of the training syllabus and therefore subject to examination - have, in fact rarely been set in either intermediate or final examinations up to now, and the environmental relevance of training subjects has so far not been examined, apart from the first experiments in the metal sector, for example, there is a certain amount of confusion among both on-the-job training personnel and examiners, as to how environmental protection is to be taught in the training course, and what issues are to be considered particularly relevant to examinations.

The failure to state environmental training objectives in concrete terms, their lack of precision as to time, and the absence of examination questions on this subject mean that, in practice, training personnel in on-the-job training regard environment protection as a "second-class subject" compared with the technical training objectives to be attained within the prescribed time limits.[11]

In practice, the vague regulations thus prove to be an obstacle to the integration of environmental protection into vocational training. In view of this situation the Central Committee of the Federal Insitute for Vocational Training, in its recommendations of 1 February 1991, advocated a job-specific approach to environmental protection in vocational training regulations.[12] The environmental relevance of the occupation is in future to be presented as a separate basic element under the heading "Environmental Protection". Furthermore, the list of technical skills and aptitudes is to be extended to include "a list of environmental skills to be taught in an integrated manner". It is hoped that, if these recommendations are followed, environmen-

tal training objectives will, in future, be catered for systematically, rather than incidentally, in vocational training practice and will be upgraded in relation to technical and economic subjects.

There are no reliable data available on the latest developments in the integration of environmental training in on-the-job training. Mutz[13] reports on an admittedly not representative survey conducted by the German Industrial Training Committee on about 1000 commercial and technical training instructors from large concerns in industry, crafts, the wholesale and retail trades, banks, insurance companies and other service sectors, which revealed that environmental protection was dealt with in over 50 per cent of technical and over 33 per cent of commercial training firms. According to other findings, 80 per cent of technical and 90 per cent of commercial training instructors took the view that environmental protection would take on increasing importance both in basic and in further training.

B. Case examples

At present, we know of relatively few examples of cases where environmental subjects have been integrated into vocational training.[14] This section of the report will describe examples of such integration in which completely different approaches have been used.

Among the features that they hold in common are: the fact that environmental subjects are taught integratively, i.e. as a component of existing disciplines in specialised technical training. The themes are further consolidated as to content in the parallel training provided in the factory or firm. From the methodological point of view, the training centres on initiative-promoting processes. A correlation is also established with the training firm, to a greater or lesser extent.

These two latter aspects can also be seen as differentiating features. Whereas in the first case, the trainees themselves have chosen a problem specific to the enterprise as a point of departure for a training project, with which the trainees hope to contribute to environment protection in the enterprise, in the second example it is a question of the correlation between training and production, or production-related training. In the third case it is the philosophy of the enterprise that becomes apparent in the training project, which otherwise remains limited to the training workshop.

1. Environmental training at Asea Brown Boveri AG, Mannheim

a. The enterprise

Asea Brown Boveri AG (ABB) is a group of companies operating worldwide in the field of electrical engineering, communications and environmental technology, with its head office in Zürich. The group as a whole has about 215,000 employees. Some 41,500 of these are in Germany, working in 50 production centres and servicing firms.

Approximately 2,300 trainees are trained in about 50 training courses in 42 training centres. Most of this training is in the new industrial metal and electrical engineering occupations, which account for about one-third of all trainees (figures at 31.12.1991). The remainder are trained in commercial and other occupations.

Training in the reclassified metal and electrical engineering occupations is provided using a special system[15] of integrated texts designed to impart key skilled qualifications in vocational training. In addition to the so-called core skills of "independent action", "flexibility", "willingness to learn and learning capacity", "creativity", "ability to work in a team" and "responsibility sharing", the system also includes environment protection as an important training objective: "Another major objective of our training is to instil behaviour patterns based on energy and environment awareness both at the workplace and in private life."[16]

b. Environmental protection in training

It is considered that the need to take environmental protection into account in vocational training is a logical consequence of the present alarming ecological situation. For this reason alone, environmental protection must also be included as a self-evident component in training, regardless of whether, or to what extent, it is covered in the training regulations. The inclusion of relevant terms in the training regulations gives a certain legitimacy to the matter and can help trainers in this field, by making it easier to justify the need to involve outsiders in the training or to gain access to additional resources, e.g. for survey projects and further training programmes.

c. Environmental protection in specialised practical training

ABB holds the view that training in environmental protection should be provided not in the form of separate projects, but integrated, i.e. within the context of ordinary day-to-day training activity. Concern for the environment is reflected even in job-planning. The questionnaires on job-planning, which every trainee must complete before starting on practical work, and which must subsequently be initialled by the trainer, contain a section on "occupational safety" and more recently one on "environmental protection", in which the trainees have to enter appropriate measures.

d. Environmental protection in craft teaching

Environmental topics are dealt with separately in ABB training during the year-and-a-half basic training in on-the-job craft instruction, on the basis of trainers' manuals on "Environmental protection" and "Energy and Environment". The content of these manuals, compiled by ABB, goes considerably beyond what has been prescribed in the general training regulations. The two manuals emphasise the importance of these issues for ABB as a company involved in the production and distribution of energy. Environmental protection is also "of vital importance to the ABB image".[17] Furthermore, products that protect the environment are likely to increase their importance in the company's future supply programme. It is therefore imperative "that future ABB employees have a more comprehensive knowledge of energy production and its effects on the environment".[18] A major concern of the manuals is "the effort to bring about a change in individual behaviour patterns both at the workplace and in private life, by demonstrating the interaction of cause and effect".[19] Admittedly they concede that, while no more than a basic knowledge of environmental protection and rational use of energy can be taught in craft classes, environmentally conscious behaviour must be an integral component of general training and be "constantly borne in mind by the trainer".[20]

Manual on Environmental protection

Contents
Introduction
Ecology
Statutory regulations
Environmental protection through innovative improvements
Water and effluent
Gas and waste gas
Refuse collection, recycling, disposal
Noise
Radiation
Labelling hazardous substances
Annex
Bibliography

Manual on Energy and environment

Introduction
Energy in industry and household
Sources and uses of energy
Future energy supply
Energy production and pollution
Nuclear energy - an alternative?
Consequences
Conclusions
Bibliography

Teaching aids are divided into subject areas (cf. boxes). These contain:

- general comments on objectives, methodology, organisation of instruction and table of contents;
- suggested key questions to help the trainees process the material
- information on the individual subject areas.

Trainers are encouraged to cover one of the prescribed subject areas each month, ideally in discussion with the trainees. The assignments suggested as most suitable are presentation, discussion, surveys, projects and seminars.

e. Environmental protection in training projects: the electric car project

One exception to the principle of integrative teaching of environmental subjects is the training project conducted this year on the initiative of a group of trainees in their final year. One of the last assignments given was a project-related application of training disciplines prescribed in the general training syllabus, which the young people could design, implement and monitor independently on the basis of their relatively advanced training.

The idea for the project came from the fact that the company was planning to acquire electrically powered vehicles to replace the Vespa cars used for small transport jobs on the works premises. The reason for this was that the exhaust fumes from these petrol-driven two-stroke motors was judged to be harmful to the environment, as the added engine oil, normally used as a lubricant, was also burned in the combustion process.

The important question for the training project was whether it was economically worth while reconverting these vehicles to run on an elecrically-driven motor thus keeping them in operation, for the trainees agreed that it would not make sense ecologically or economically to scrap all six vehicles on account of their power system.

In a six-month project, prepared and carried out independently by a group of trainees in their final year of metal and electrical engineering training, one of these vehicles was converted to electric power. Precedents for this existed to the extent that, in an earlier project, an electrically driven public transport vehicle had been designed and built as a prototype, complete with all technical installations including brakes and steering.

The following were among the jobs carried out by the young trainees in the course of the reconversion:

- modification of the existing engine-gearbox unit
- construction of a device to house the battery
- modification of a an available electric motor
- installation of the electric motor
- minor jobs such as wiring the entire drive system, installation and wiring of gauges and transformer, and the design and construction of housings for battery and DC motor.

A further component of the project was the drawing up of the overall statement of all costs arising from the reconversion. The trainees entered this project for the 1992 "Youth Research" competition, where they won second prize in the Baden-Württemberg elimination contest in the "Working world" section. They also submitted their reconversion of the vehicles to electric power as a suggestion for improvement in the company. No decision on this matter had been taken at the time of the survey.

2. Environmental protection in the Linke-Hofmann-Busch Gmbh (Salzgitter), training programme

a. The enterprise

The Linke-Hofmann-Busch (LHB) PLC in Salzgitter is a subsidiary of the Preussag Group, which builds locomotives and railway wagons. It manufactures goods wagons of all types, trams, underground and overground suburban trains, long-distance passenger

trains, railcars, bogies for passenger and goods wagons. It also sees to the servicing and maintenance of such wagons.

Among its approximately 2,300 employees, 120 are trainees undergoing training in 12 (industrial and commercial) skilled occupations. Training is provided in a training centre and in a number of plants where the training is closely related to production.

b. Environmental protection in training

Since the reclassification of the metal and electrical engineering occupations in 1987, the company's trainers have increasingly been grappling with the problem of how the prescribed and necessary independent planning, implementation and monitoring is possible during training, with environmental aspects constantly taken into account under an integrative system. The answer so far has been a series of training proposals, in which training is linked to production, and environmental protection to occupational safety.

c. "Job-Safety-Environment protection" checklist

The company training personnel has compiled a manual on the subject of solvents/hazardous substances, which also contains a checklist that can be used in training.[21] The handling of dangerous substances is a day-to-day aspect of work in the metal industry. The object of the checklist is to prepare the trainees for the responsible and conscientious handling of dangerous substances.

Occupational safety and environmental protection are accorded equal consideration with rational and economic criteria in the design of training processes. Occupational training is intended to prepare trainees to work not only in an economical, efficient and precise manner, but also with an eye to safety and environment protection. The checklist helps them to put this principle into effect throughout their entire training. In all jobs involving the use of hazardous substances, the list can be used as a testing and planning instrument, and it is hoped that these young skilled workers will continue to use it after they have qualified.

With the aid of the list the trainees cover the following (planning) stages:

- they determine the substances (and the composition of the substances) that will be required in order to carry out an assignment or process, and estimate the length of time during which they will have to handle these substances.
- They consult the available literature to ascertain the health and environmental hazards created by these substances and examine the question of recycling or disposing of residues.
- They estimate the level of dangerousness of the substance, make suggestions as to how it can be handled without harming the workers' health and safety or the environment, and consider possible alternatives.

The checklist has, so far as we are aware, been well received in training practice by all concerned. One problem that has not yet been resolved is the question of how to proceed when working with solvent compounds, since threshold values have been established for individual substances only. The combination of substances has not yet been sufficiently investigated, so that the hazards arising from compounds are difficult to estimate. It is still open to question whether the checklist can be applied in production-related training as well as in the sheltered training workshop.

d. Training project on noise insulation casing

The idea for this project was provided by a concrete problem in the company's production sector, which the skills available in the training system were required to solve. The object was to construct a noise insulation casing for a HF - (High Frequency) converter in one of the plant's production shops, using a team of three trainees (in the occupation of "Construction engineer, sheet metal construction"). This device was to reduce the noise emission from the converter from 90 dB(A) (at one metre's

distance) to 76 dB(A), which would considerably diminish the noise nuisance for the workers in this production sector.

Work on the project involved the following working and learning stages:

- Information stage, in which the training supervisor explained the nature of the assignment, the object of the succeeding assignment and its correlation with previous training assignments;
- On-site measurements, i.e. on the HF converter to be covered;
- Drawing up the assignment schedule;
- Drawing up a blueprint of the noise insulation casing;
- Ordering the materials;
- Construction of the double-shell casing;
- Notification of completed project to the technical safety department;
- Collection and testing by the technical safety department

The trainers saw the construction of the noise insulation casing in the training workshop, a job that took four weeks in all, as a complex project-oriented exercise in the promotion of environment-related occupational skills among the trainees. The preparation by the trainer involved determining the knowledge and skills listed in the general training syllabus that could be taught or reinforced in the course of this exercise (e.g. "conversion").

In order to teach the other environmental skills required, the project was supplemented by an experiential and action oriented course "Introduction to Environmental Protection in Industry", regularly held for trainees in their second year. This comprises three blocks, each lasting a double teaching-period at weekly intervals, and an assessment, which is conducted about six months later. The central theme of the course is "Noise", which is examined both as a basic phenomenon and as an industry-related environmental problem. Noise levels are measured in the factory and measures of noise prevention proposed where possible. The assessment is mainly devoted to a review of suggested improvements.

There are a number of indications to show that the trainees have become more aware of noise pollution and more responsible in their thinking and actions as a result of the "noise insulation" project-oriented exercise. The training system has thus taken on an important function in the spreading of occupational health and safety and environmental protection, as the training workshop has, in recent years, made over 30 noise insulation casings - and a noise insulation cabin - for use on the production site.

3. Environmental protection in the Stadwerke Hannover AG

a. The enterprise

The Stadtwerke Hannover AG, founded in 1922 by the Hannover municipality and the association of local government authorities for Greater Hannover (Zweckverband Großraum Hannover), supply households, commercial enterprises and industries in and round Hannover with electricity, gas, water and district heating. The Stadtwerke Hannover AG employ some 3,600 persons (figure for 31.12.1990).[22]

In recent years the Stadwerke have developed from being an energy supplier to an energy service enterprise. This is reflected, among other things, in extensive consultancy and service facilities in the field of energy-saving and the application of economical and ecological environmental technology. The Stadtwerke are part of the Federal German Working Group for Environmentally Conscious Management (Bundesdeutscher Arbeitskreis für Umweltbewußtes Management), (B.A.U.M) a management environment initiative, and of the "Local Supplier Firms' Study Group for the Promotion of the rational, economical and ecological use of energy and water" (ASEW - Arbeitsgemeinschaft kommunaler Versorgungsunternehmenr zur Förderung rationeller, sparsamer und umweltschonender Energieverwendung und

rationeller Wasserverwendung). The Stadtwerke also operate installations for the utilisation of renewable energy in power generating, with a hydroelectric power station, a solar "filling station" and a wind power plant.

They train between 140 and 150 young people a year in one commercial occupation, three metal engineering occupations and one electrical engineering occupation. As part of their training in metal or electrical engineering, after a year of basic training in the training workshop, the young people train in various production centres according to their subject area. These include electricity works, gasworks and water works.

b. Environmental protection in training

A publicity brochure intended for schools emphasises the importance of environmental protection in the enterprise: "Special priority is given to environmental protection. Another major objective is the opening-up of new fields of activity, especially in the expansion of the service sector and in the promotion of renewable energy types".[23] The importance of environmental protection in the company's philosophy is also reflected in their training. Thus, in the above-mentioned brochure, the presentation of the skilled occupations and the content of the training provided also mentions environmental protection, and, on "Training Day", the training project described below is used to recruit candidates.

c. Training project "Design, construction and monitoring of a wind energy plant"

A training project to examine how energy can be integrated into vocational training is currently being tested in the technical training centre.[24] This combines a number of objectives: to promote energy awareness among the trainees by explaining the effects produced on the environment by energy production and consumption, by demonstrating ways of saving energy and the use of renewable energy sources and applying them in practice. Updating of training disciplines (see below) by way of project-oriented practical work on a wind power plant makes it possible to relate disciplines prescribed in the general training schedule to environmental disciplines; the involvement of trainees from all industrial and technical occupations enables all the young people to identify with the training objective.

The training objective is reinforced by a manual on the use of renewable energy. This contains basic information on the principles of energy production. Moreover - and this is the central issue - the use of wind power is dealt with mainly from the technical point of view, special attention being given to energy potential, various types of wind power plants, as well as aspects to be taken into account in the planning and operation of wind power plants, such as choice of site, building permits, environmental protection and safety aspects. Finally, an assessment is conducted - involving a press conference among other things - on the production and consumption of conventional and alternative energy, especially from the point of view of environmental protection.

The manual also contains a project proposal for the planning, design and construction of a wind power plant. Such a plant is currently being built in the grounds of the training centre. It is for the most part a do-it-yourself construction. The parts needed for the building of the installation are made as far as possible by the trainees themselves. Thus, for example, the entire construction of the wind power plant is being carried out by industrial and plant engineeers in their third year of training. All work in connection with electronic control, power supply and distribution is being done by energy electronics engineers. Components that cannot be manufactured in the training workshop, such as rotor, rotary crane, generator and mast, have to be purchased.

As part of the in-plant instruction accompanying the training, an expert survey was conducted on the topic of "Pollution through energy consumption", prepared, evaluated and subsequently documented in the form of a report by the trainees. The trainees also carried out an inspection of a wind power plant supply-

ing the mains system and subsequently evaluated it.

The manual and the entire wind power plant are expected to be completed by the end of this year. However, the project will not be finished with the construction of the plant. Once the plant has been completed, training assignments will be carried out on it. There are ideas for introducing changes, for example, in the braking system, the gear ratio between rotor and generator, the electronic control system and the storage system..

Up to now the training project has been limited to the training workshop; it has not yet had any effect on other parts of the works, which can be explained by the fact the the individual works units are located at long distances from each other.

Costs are a critical aspect. The training project is relatively expensive; its extension to other enterprises is thus likely to be limited.

IV. Environmental studies in the further training of training personnel

A. Present situation

Environmental protection, as specified in the general training syllabi, presents the enterprise training personnel with a new task. Trainers are required to meet many challenges: they must provide an example by respecting the environment in their actions. As teachers they must see to it that the trainees under their care acquire environment-related knowledge and skills, and respect the environment in their actions. As employees of the enterprise they are caught up in a constantly changing interreaction of environment and training regulations, economic, technical, organisational and communication conditions and interests.

Trainers have repeatedly complained to us that they often feel left to their own devices in these new functions, for which their own training and employment have insufficiently prepared them. For example, questions on environmental protection in vocational training have still not been introduced in the examinations prescribed by the Trainer Aptitude Ordinance. In general, training personnel lack the necessary technical, as well as the professional teaching competence, suitable teaching and learning aids and sufficient support from within and outside the firm, for example in the form of further training programmes.

This situation was taken into account by the BIBB Central Committee and the German Parliamentary Survey Commisssion for "Future Education Policy - Education 2000" in its recommendations in the late eighties and early nineties. They define further training of in-plant training personnel as a major starting point for teaching environmental skills in the course of in-plant training and for promoting respect for the environment at the workplace.[25]

As regards the further training of training personnel in environmental training the situationis as follows:

- Further training is voluntary in principle. There is no legal obligation to undergo further training. Participation is conditional on the time off granted by the employer for this purpose.
- the further training market is ill-defined and has not been explored to any great extent. A multitude of public, semi-public and private suppliers are competing in this sector.[26]
- As an admittedly not very representative survey carried out by the author confirms, further training opportunities explicitly intended for trainers tend to be the exception.[27] When such opportunities exist, they are part of internal company training programmes or are promoted by professional associations, trade associations and and trade unions. It must also be borne in mind that it is mainly only the large concerns that can offer further training opportunities.
- Training opportunities that focus on the technical or legal aspects of environmental protection tend to predominate. Far fewer further training opportunities contain components designed explicitly for environmental training in the context of vocational training. Courses that expressly link the technical and didactic aspects together tend to be the exception.
- Educational policy decision-makers have reacted to this dilemma by introducing national pilot projects, the purpose of which is to provide an innovative impetus for job-related environmental studies.[28]

B. Case studies

Three very different training institutions, namely the University of Hannover Working Group on Environment Protection and Vocational Training, the Further Training Initiative (bfw = Berufsfortbildungswerk) of the German Federation of Trade Unions and the Asea Brown Boveri (ABB) were chosen to illustrate further training concepts. These institutions support training personnel in the field of job-related environmental studies by:

- providing teaching and learning aids to involve as many trainers as possible, if not to all training personnel employed in the enterprise;
- providing further training courses, in order to promote environmental awareness and exchange of experience among the participants, who are generally from different sectors or plants, and to familiarise them with new training methods.

The step-by-step programme of the Working Group on Environment Protection and Vocational Training is long-term, multidimensional and geared to practical application. It is designed to be a comprehensive training programme placing special emphasis on technical, educational, job and plant-related aspects. It appeals to trainers in their capacity as learners, but also in their capacity as trainers and thus as actors within the enterprise. It is they who are to provide the ideas for environmental training. They acquire the necessary data to a large extent independently and produce environmental training concepts and materials on their own initiative. They put this experience into practice in their training work, as far as possible involving the personnel in the technical and organisational context of the training.

The two-stage further training programme of the bfw is based for the main part on that of the Working Group on Environment and Vocational Training. It applies exclusively to bfw trainers. Basic technical instruction and teaching skills for environmental training are provided by means of introductory and advanced seminars, where environmental problems and organisational difficulties in environmental protection typical of the bfw are also discussed. A group of trainers is responsible for conducting the seminars. The implementation of seminar findings is indeed considered desirable, but is seldom systematically supported.

The ABB model is a short-term programme, focused mainly on vocational training and sees itself above all as a catalyst in environmental protection. Trainers attend a three-day seminar primarily to increase their awareness of environmental problems and to familiarise themselves with new training methods. There is no provision for their immediate inclusion in the training provided on site.

1. Further training programme of the Hannover University Working Group on Environment Protection and Vocational Training

a. The Working Group

The Working Group on Environment Protection forms part of the University of Hannover faculty of Education II. It has been conducting research in the field of job-related environmental training for several years, conducts further training courses on the subject and develops training materials.

b. Organisation and objectives

The Working Group on Environment Protection and Vocational Training is developing and testing a long-term, multi-staged further training project for environmental trainers as part of a four-year pilot project (1989 to 1993) sponsored by the Federal and Lower Saxony Governments.[29]

It collaborates with a permanent group of 29 trainers from a number of Lower Saxon training establishments of various sizes and in various sectors of the economy, providing on-the-job, external and industry-wide training. In this further training project, trainers are trained in a particular discipline and in teaching methods, introduced to ecological thinking and

qualified to examine possible fields of action in environmental protection in industry, to develop teaching and learning aids in training work, and to test industry-related implementation strategies.

From the point of view of time and organisation the project is divided into three phases (basic phase, advanced phase and implementation phase) which are characterised by increasing co-ordination between training and industry.

c. Basic phase

In the first phase, the Working Group on Environment Protection and Vocational Training conducts three-day non-specialised industry-wide basic seminars.[30] These seminars are intended as a lead-in to a longer-term study of job-related environmental training. They are devoted mainly to clarifying the general requirements of job-related environmental training, analysing the environmental trainer's role, examining possibilities of action in the training itself and in the industrial system, and motivating the trainers to take action in the field of environmental training.

Basic seminar "Environmental protection in Vocational Training"

Programme

First day

Personal attitude to the topic - what participants expect from the seminar

- Presentation with the help of an object from "Environment/rubbish dump"
- Metaplan technique

Comparability and systemisation of earlier experiences

- Group project: sorting out the "Rubbish dump" or
- Group project: drawing up an "Environment map" interconnecting the chosen objects.

Technical aspects of industrial environmental problems

- Case study: Literature-based group project/role-playing
- or Demonstration and questions to experts

Second day

Associations: Environmental problems and environmental protection in the industrial system

- Network
- Paper and computers: individual project/group project
- Discussion

Third day

The role of the trainer in the enterprise: scope for action and barriers to environmental training

- Role-playing
- Group study

Environmental protection in on-the-job training

- Exchange of experiences
- Presentation of theoretical approaches and practical examples
- Group project: elaboration of an implementation plan

Seminar criticism

- Metaplan technique

The basic or introductory seminar follows the didactic principles familiar from the environmental training debate, i.e.involvement, integrity, associative thinking and co-ordinated action. This is reflected in the choice of seminar methods, which - it is basically assumed - can also be implemented when actually carrying out training.

This basic seminar has been tested several times in the context of structural change and has proved to be a good introduction to the analysis of environmental protection and environmental studies in vocational training,[31] though it only partially lived up to the technical expectations formulated by some of the participants.

d. Advanced phase

In this phase, aspects that had been briefly dealt with in the basic seminar are analysed in greater depth in the light of concrete training-related examples. A characteristic feature of this phase is the composition of the working group: representing one specific occupation industry-wide. In the five working groups created in the spring of 1990, between four and six trainers, usually from two co-operating enterprises, study and work together on a topic they have chosen themselves (see Box) They develop training materials and projects on the chosen topic, for the most part independently.

Self-motivated learning and teamwork are important didactic principles in the study group. Each study group is to a large degree responsible for designing its own learning and working process and also for the concrete results and/or products arising from them. They are supported in this by a member of the Working Group on Environment Protection and Vocational Training and by experts if they so request.

Focal topics for the study groups

(renewable) energy

Refrigeration lubricants

Solvents in industry and craft trades

Synthetic substances in the home

Detergents and cleansing agents in the home

The study groups soon adjusted to a steady working pace and generally met once a month for a whole or half day in the enterprises or the working group's premises. The training documentation of all study groups has been available since the middle of this year. Apart from topic-related factual information, it contains methodological suggestions and/or tools for use in the training process, which is intended to be conducted in the form of projects and with the help of checklists, eco-guidelines and eco-diaries (see Box on p. ?). Furthermore, one group working on home economics took certain steps towards co-operation between school and industry (learning centre co-operation).[32]

Results of the Study group

Projects : Wind power plants, phoactive installation. Solar charger for nickel-cadmium batteries

Project: "Compulsory inspection of refrigeration lubricants"

Checklist "Work-Safety-Environment protection" a compulsory planning and monitoring tool instrument for all work involving problematic substances

"Eco-guideline for households" a guide to daily decision and action in the light of the effects on the environment

Eco-diary to monitor environment-conscious household activity

Exhibition "Life story of a garment".

The study group work is supplemented by a half-day or full-day seminar about four times a year. The purpose of the seminar is to explain and interpret developments during the advanced phase, to draw up an interim progress report and to provide new impetus for further work.

Although the study-group learning method is relatively new to certain trainers, they have reacted positively to it on the whole. Learning with one another and from one another, looking beyond the narrow confines of one's own activity, trying out unaccustomed things, discovering new capacities, doing something tangible for vocational training, these are just a few of the descriptors that might be mentioned here. But there were also certain problems, chief among them being the time aspect. The advanced phase went on for a period of just under two years. This was mainly

due to the comprehensive training syllabus and the extra pressure this entailed in terms of study group meetings and the completion of home assignments. This was in some cases increased through travelling considerable distances and co-ordination problems between the partner enterprises.

e. Implementation phase

The training projects and materials developed by the study groups are at present being tried out, tested and, where necessary, revised in the co-operating enterprise. Another essential element of this phase is that the organisational, technical and personnel departments immediately concerned by the training are involved in the implementation, so as to support the intiatives begun by the trainers and harmonise them with company environment protection policy. Appopriate strategies for this have been developed in the Study groups. The first talks have taken place with those responsible in the departments in question.

f. Transfer of further training concept

Transfer of the basic phase: to spread the concept of the basic seminar, three multiplier seminars involving some 60 further trainers have been conducted in the BBIB. They were given this opportunity so as to reflect upon the teaching methods used. The number of registrations indicate that there is a good possibility of being able to conduct the seminar subsequently with trainers and/or trainees.[33]

Transfer of advanced phase: The long-term study group concept has been applied in a three-to-four-day advanced seminar. In the meantime three such seminars have taken place on the topics of "refigieration lubricants" and "solvents". Here too the participants learn about the topic on their own with the help of various methods (literature, expert surveys and investigation) and present it in the form of an environmental trainer's manual.[34]

2. Retraining programme of the Berufsfortbildungswerk (Further Training Organisation) - non-profit making institution of the Federation of German Trade Unions, Düsseldorf-Erkrath

a. The institution[35]

The Berufsfortbildungswerk (bfw) has been active in vocational training, retraining and further training in West Germany for the past 40 years or more. An increasing number of measures with a view to (re-)integration into the employment system have been carried out since the seventies. In the year 1991, bfw programmes were distributed as follows: retraining (22%), further training for promotion (9%), further training for adjustment (45%), career preparation (5%), initial occupational training, career guidance (12%) and programmes in political (3%) and general (4.9%) education.

The structure of programmes available is distinctly influenced by clients/sponsors. About half of the 56,000 participants in 1991 attended programmes conducted on behalf of the Labour Administration. Therefore just under half of the participants were unemployed before they joined the programme. The occupations predominating in the programmes available in 1991 were in the technical industrial sector (34%) followed by commercial-adminstrative programmes (30%).

The bfw is organised on a decentralised basis and made up of 18 district adminstrative offices, two special institutions and the central administration. Within the 18 district administrative offices, 97 branch offices and sectors as well as 274 employment- promotion and training centres have been established. The bfw employs 2,235 persons on a full-time basis. Since 1990, the bfw has also been operating in the New Länder.

b. Environmental protection in the further training of on-the-job training personnel

In order to meet the challenges of environment protection in job-related training within

the bwf, an environment consultant was appointed to the central administration in 1991. His function is to support the workshops in their efforts to protect the environment, to provide advice when requested and to participate in the development of programmes and in the further training of internal personnel.

A decisive factor in the inclusion of the environment as a topic in the internal further training programme organised by the bfw central administration was the reclassification of the metal and electrical engineering occupations in 1987, according to which environmental protection and occupational safety are to be taught throughout the entire training course.

That this requirement has encountered a certain amount of difficulty in training practice is borne out by the findings of a written questionnaire compiled by the environment consultant. The questionnaire which was sent to 44 selected vocational training establishments, sought information on environmental training and environmental protection in technical training. The findings indicated that, owing to lack of material, the courses could only be dealt with in technology classes, and there only superficially and on the basis of the sparse legal information contained in specialised books.

Against this background, the bfw collaborated for the first time with the Working Group on Environmental Protection and Vocational Training at the University of Hannover, in conducting two non-job-related basic seminars on environmental protection and environmental studies in 1990 and one specialised job-related advanced seminar in early 1992 as part of the internal further training programme. This also laid the foundations for the permanent inclusion of environmental protection in the internal further training curriculum. In the meantime, various types of seminar have become established on the further training market.

The central element is a two-staged seminar model. Essentially based on the programme of the Working Group on Environmental Protection and Vocational Training, environment-related introductory and advanced seminars are provided for trainers in the reorganised metal and electrical engineering occupational category, as well as trainers from the gardening and landscaping sector. An important feature of these seminars is that technical and ecological aspects as well as vocational training aspects are linked together.

The more job-related introductory seminar is intended for trainers or teachers from two related occupations or occupational fields (metal and electrical engineering; gardening and landscaping with florist training). The object is to increase awareness of environmental problems and lay the foundations for technical, ecological and environmental training. A further ingredient is provided by job-related advanced seminars on an environmental problem relevant to training and the workplace, technically reinforced and presented in the form of recommendations on implementation in training practice.

Bfw also conduct other seminars. They are prepared and conducted by a group of trainers, who took part in the first two basic seminars. In co-operation with the environment consultant, this group has modified the programme to be in keeping with bfw interests and job-related aspects. Objectives, core content and methodology are shown in sample seminars in the following two pages.

Introductory seminar: environmental protection and environmental training for action in the metal and electrical engineering sector

Objectives

- on-site identification of environmental problems
- introduction of associative thinking
- scope of action of bfw training personnel in environmental protection

First day

Problem-oriented presentation

- collection of participation motives and on-site environment problems by means of the metaplan technique

Ecological associations using a stamping machine as an example

- Demonstration: oil-soaked sawdust
- work in groups: paint/varnish, energy; lubricants, machine control
- Presentation and discussion

Non-job-related associations

- game "Ecolopoly"

Second day

Waste - a selected environment problem

- introduction: metaplan, foils
- preparation of the excursion

Excursion to a household waste disposal site

Third day

Situation of bfw trainers in environmental protection using solvents as an example

- association
- "Paper computer": individual and group work
- Discussion

Problem and media exchange

- technical information
- training documentation

Seminar criticism

Introductory seminar: environmental protection and environmental training for gardeners, landscape gardeners and florists.

Objectives

- introduction to the principles of natural landscape care and development
- teaching of ecological principles
- critical analysis of the job outline for gardeners

First day

Subject-oriented presentation - what is expected from the seminar

- job-related environment
- metaplan

understanding and dealing with nature from the social and job-related point of view

- Film "Grün kaputt"

Discussion

Second day

Project "Naturnahe Stadtbegrünung" (natural green spaces in cities)

- Slide show and discussion
- Excursion: visit to the project and other natural sites

Third day

Environmentally sustainable design of a private garden as an aid to implementation in training

- Group project
- Presentation and discussion.

In the meantime five basic seminars (three of them bfw-organised) and one advanced seminar have been conducted, in which a total of 88 trainers participated. For the period covered by the scheme, three more basic seminars and three advanced seminars focusing on hazardous substances, refrigeration lubricants, and greenery on facades and roofs are to be organised. These generally last for five days.[36]

The environmental concept has been increasingly addressed in recent seminars for trainers in the field of commercial, building and timber occupations. The environmental aspect is usually integrated into existing technical seminars.

Examples from the bfw internal further training programme for 92/93.

heating insulation including aspects of ecological building

surface-finishing in the cabinet-making trade

new problems and possible solutions in business management studies and environmental protection and occupational health and safety in the office

Practical impact: Since the voluntary principle means that in-plant further training is undertaken only by a limited number of trainers employed by the bfw, it is basically assumed that the effects of the seminars will be passed on by the participants to their colleagues, and implemented at the workplace.

Conversations between the environment consultant and former participants at further training courses have revealed, however, that this distribution effect has been produced on only a few occasions. The reasons for this seem complex. Presumably the obstacles are both personal and related to the organisation of training. Here are some examples: with a teaching commitment spread over the whole day, there is scarcely any time to change the curriculum. In the technical industry sector above all others, environmental topics still have a negative image. Even in matters of environmental training, trainers tend to hold fast to their role as specialists in their subject, although they can seldom live up to this claim in view of the dynamic and complexity of this problem area. Not least because of this situation, the bfw central office is trying to help training personnel by providing additional programmes in their environment-related training endeavours.

c. Material aids and course guidelines as support measures for environmental training

Material aids: the environment consultant is currently preparing course material with practical job-related tips on behaviour and action that respect the environment.

So far there is a brochure available for the recently reclassified office jobs.[37] It contains advice on the following issues

- office supplies and their effects on the environment
- ecologically preferable alternatives to traditional office supplies
- how to obtain office supplies that respect the environment
- organisation by the office of its own waste disposal.

A similar document is planned for "environmental protection in metal workshops". These documents are made available to all concerned teachers and trainers. This applies also to the recommendations and manuals resulting from the advanced seminars on the topic of refrigeration lubricants, which contain methodological guidelines for training work, as well as factual information.

Course guidelines central idea: environmental protection should be the leitmotif of bfw internal guidelines and thus be constantly brought to bear in organising the content of training courses. Guidelines for the courses in certain building occupations (e.g. drivers of building machinery) and the training of office buyers have already been revised in accordance with this principle.

d. Prospects: regional study groups

In view of the size and decentralised organisational structure of the bfw and the need to improve and ensure the quality of environmental training and protection in as many vocational training establishments as possible on a permanent basis, it is planned in the long term to form regional trainer study groups. Their function would be to react to obstacles arising on the job and to play an advisory role. They would be expected to see to it that environmental training was included in training courses, to bring their influence to bear on organisational regulations concerning training, and to help trainers to develop correct attitudes to the demands of job-related environmental training. It is not yet certain, however, how many regional study groups are to be established, who should take part in them and how the necessary release from duties can be organised.

3. Further training project of Asea Brown Boveri AG, Mannheim

a. The enterprise

As mentioned in Chapter II, Asea Brown Boveri AG (ABB) is a group of companies operating worldwide in the field of electrical engineering, communications and environ-

mental technology, with its head office in Zürich.

b. Environmental protection in the further training of trainers

In 1990 the central training and further training department began to provide three-day further training seminars (20 hours) under the title of "environmental protection, energy and environment, moderation", intended primarily for trainers in technical industrial occupations and related thematically to the company's product range. Seven such seminars had been conducted by August 1992, involving the participation of 70 of the total of 150-160 trainers employed full-time by ABB. Another such seminar was conducted in September 1992.

In principle the company's further training department organises trainer seminars with a technical or training-related focus. All trainers employed by ABB must, if possible, attend one such seminar per year.

The seminar on "environmental protection, energy and environment moderation" is one of the training-related seminars. Its object is first and foremost to instil awareness and provide impulses for training in environmental protection. This initiative is based on the principle that trainers are to be motivated to include environmental training in their day-to-day training activities not by amassing knowledge but by increased environmental awareness. In this they should be supported by the company representative responsible for environmental protection, and be informed as to the latest developments in environmental technology at the site in question, and on the environmental regulations in force there.

Under these conditions, the seminar "environment protection, energy and enviroment, moderation" aims less at imparting environment-related technical knowledge (scientific principles and contexts, statutory regulations etc.) but is intended to make the participants feel involved and familiarise themselves with the best training methods (moderation technique) and media.

The seminar is therefore not job-related and concentrates on the following issues

- "environment protection ", "energy and environment", "environment protection at ABB"
- Introduction to the two trainer manuals compiled by ABB "Environmental Protection" and "Energy and Environment"
- Introduction and application of the Moderation technique;
- Presentation and evaluation of films on the theme of environmental protection and energy.

The most important methodological elements are seminar papers, moderation exercises, group projects and films (see box). The seminars are conducted by two staff members from the training and retraining department, the section on "Environmental protection at ABB" being taken over by the environment consultant for the entire group of companies. He co-ordinates safety procedures and environmental protection for all ABB companies in Germany.

Seminar "Environmental protection, Energy and environment, moderation"

First day

Opening ceremony, statement of seminar objectives, organisation

Global pollution

- Paper on general principles

Environmental protection at ABB

- Introductory paper

Environmental protection in daily life and work

Environmental protection in vocational training

- Methodological tips

Recycling - a contribution to environmental protection

- Film

Introduction to moderation

Second day

Influences that pollute our environment

- Moderation exercise

What environmental hazards need most urgently to be remedied/ can most easily be remedied

- Moderation exercise

Energy and environment

- Methodological tips
- Energy and environment, primary sources of energy, mankind's energy needs, energy reserves

Energy and environment: energy consumption and environmental pollution

Film on the theme of energy and environment

Third day

Energy and environment: future energy supply

Rational use of energy: how can we save energy in our daily life and work?

- Moderation exercise

Final discussion.

While immediate transfer into training practice is not intended, the seminar has brought about changes in environmental training, though these have not been systematically registered by the training and further training departments, due to time and cost problems. Here are a few examples: after such a seminar, one training workshop collected filings and scrap metal, which it sorted out according to type of material. A project for the separate collection of waste paper, conducted by the training department at the Käfertal plant is now to be applied to all plants. As part of a Youth Research Project, an automatic coffee machine was modified so that instead of plastic mugs, cardboard mugs may now be used, or customers may bring their own cups (cardboard mugs cost 10 pf extra).

All in all, the training and further training department considers this further training concept to be "a sensible compromise between what would be desirable, from the point of view of content and time, and what is actually feasible with ever-increasing time and cost pressures."[39]

V. Environmental training in technical colleges

A. Organisation and objectives

Technical colleges, where apprentices in the recognized apprenticeable trades attend specialised courses for one or two days a week or in single time blocks, have a dual function: "the technical college provides basic and specialised technical training and broadens the earlier acquired general education. Thus it is intended to train the apprentices to fulfil their function in their occupation and help to shape working and social life with a sense of social and ecological responsibility".[40] This is done in the general subject courses, e.g. sociology, and in job-related subject courses, e.g. technology or economics. To complement the practical emphasis of training in the enterprise, the emphasis here lies rather on systematic associations, technical and scientific as well as economic and sociological.

It is generally considered that the contribution of the technical college to environmental training should not be confined to the mere teaching of environmental protection regulations at the workplace. It should examine the ecological principles and technico-economic conditions of concrete cases of pollution in consumption and employment, and seek individual possibilities of environmentally conscious behaviour in both spheres. For this it is essential to encourage the young people's sense of responsibility, motivation and empowerment in addition to teaching them technical skills. Teaching methods should therefore include reflection on individual experiences and project work. This concept is not covered in one specific curriculum subject; environmental training must be integrated into existing subjects.

Analyses of environmental training in Germany show that these principles cannot be said to be applied in all technical colleges.[41] There are complaints of a shortage of environmental references in the syllabi, of suitable teaching materials and a lack of understanding among the teaching staff when it comes to new teaching methods. Admittedly, the technical college is often under-represented in empirical surveys on environmental training. This results in an incomplete picture, which is not greatly improved by the very formal report on environmental training produced by the Conference of Ministers of Education.[42] There are, however, several isolated activities being carried out with a view to improving environmental training in technical colleges. The following section contains a few examples taken from curriculum work, pilot experiments and teaching practice.

B Case examples

1. General curricula

Teachers at technical colleges are civil servants employed by an individual state; they teach the curriculum laid down by the Minister of Education and the Arts (Kultusminister) of the state in question. For the purpose of co-ordination, a "Permanent Conference of Education Ministers" (KMK) has been established to develop the general curriculum outline and, under the terms of the 1972 "record of their meeting" (gemeinsame Ergebnisprotokoll), to co-ordinate with the Federal Government's General Vocational Training Curriculum for vocational training on the job. The Länder accept these curricula or use them as a basis for their own curricula. Learning objectives and subject content in respect of environmental protection as contained in these curricula provide no guarantee of sophisticated environmental training in the classroom, but they do give the necessary orientation and legitimacy. An analysis of KMK general curricula for major skilled occupations in 11 out of 13 oc-

cupational categories involving about two-thirds of all apprentices shows considerable differences in their approach to environmental protection.

There is no comprehensive KMK general curriculum for the general subject "sociology" in the technical college, so the individual Länder have developed their own curricula. The Land of Lower Saxony has a course called "environmental protection" which includes the following objectives: with the help of case examples.... Describe instances of environmental pollution or change as a result of human interference in the ecological balance" ... Discuss environment problems in the light of technico-economic development", ... Be prepared to co-operate as an individual in improving the environment".[43]

The KMK general curricula for job-related instruction at the technical college have since 1983 contained the same preliminary remarks on environmental protection for practically all occupations in metal, electrical, construction engineering, nutrition, health, laboratory, commercial, and printing trades:

The apprentices must

- "be aware of the possible conflict between their individual aspirations, those of their peers and the demands of the environment, and be prepared to contribute to a restoration of equilibrium and to endure tensions"
- "be able to describe the pollution associated with the practice of their trade, and measures to avoid or reduce this".[44]

These learning objectives are very general and offer few possibilities of action. They can be regarded as no more than declarations of intent unless they are complemented by concrete instruction in the technical part of the curriculum. This occurs to a large extent in the case of the occupation of "supply and disposal technician", where the cycle of natural substances and the danger threatening them from agriculture, industry and private households, as well as the principles, statutory regulations and technical procedures for the improvement of water supply, waste water disposal and treatment of wastes are dealt with in a concrete manner. This is, of course, a special case, since the occupation has been created specifically to meet the need for technicians in installations devoted to environmental protection. In the case of the other skilled occupations it is primarily a matter of altering traditional structures by introducing the element of environmental protection. This has been attempted in KMK general curricula mainly since the reclassification of electrical engineering occupations in 1987.

The general curriculum for the industrial metal engineering occupation of "construction engineer" provides an example of this development. In the basic training stage there is a learning objective, which is also applicable to other metal engineering occupations: ... "observe economic, environmental and health-related aspects when handling materials". Among the aspects mentioned are "costs and availability of materials, health hazards, disposal, recyclability".[45]

In the advanced training stage for the metal, shipbuilding, equipment and sheet metal engineering occupations the following subjects are dealt with

- the importance of testing techniques in environmental protection
- shared responsibility for observance of environment-related disposal guidelines in cleaning, emptying, storing, transport and disposal;
- environment-oriented choice and disposal of detergents, lubricants and solvents;
- heat and noise insulation, energy saving
- use of plasma and electron welding in view of pollution and disposal.

This stimulates concrete professional thinking on environmental protection, but neglects ecological and economic matters.

The KMK general curricula for other reclassified metal engineering occupations, especially metal crafts, as well as for office buyers, sales personnel in the retail trade and office communications, also contain concrete

job-related environmental learning objectives. In the electrical engineering occupations reclassified in 1987 and for dental assistants, for example, such objectives are almost totally lacking. Distinctions are occasionally made between occupations directly and indirectly concerned with the environment. This cannot explain the situation here though, as there are sufficiently well-known environmental considerations to be taken into account in the case of electrical engineering occupations, with regard to energy production, treatment of batteries and disposal of unserviceable electrical equipment.

The older KMK general curricula usually contained very few environmental training objectives. This is true of the building trades among others. In view of this situation, Lower Saxony drew up its own curriculum for the basic training year for construction engineers in 1988. The training objectives concerned the development and disposal of protective substances for wood, synthetic materials and cement fibre-board. It is noticeable that several teachers who had taken part in pilot projects on job-related environmental training were on the curriculum planning committee in question.[46]

2. Teaching materials and pilot projects

It is clear that if the requirements for environmental training in technical schools are to be met, the teachers will have to possess a high degree of technical knowledge and teaching ability. However, they often lack elementary knowledge of the various types of pollution, their causes or the possibilities of changing them. Many also have difficulties coping with action-oriented teaching programmes. For this reason technical college teachers have participated in several pilot projects in recent years, on the evaluation of teaching experiences and the development of teaching materials for the inclusion of environmental topics in technical college teaching. Thus, many teaching aids have been developed on behalf of the Federal and Land Government Commission (BLK) at the Secondary Level 2 School Centre in Bremen and at Technical Training School 3 in Hannover; on behalf of the European Community (EC) at Arbeit und Leben/Federation of German Trade Unions in Bielefeld, and on behalf of the UNESCO Liaison Office at the Federal Department of the Environment by the Agrar-Soziale Gesellschaft in Göttingen and the University of Hannover Working Group on Environment Protection and Vocational Training. The following is an example of a pilot project conducted by the Hannover Working group.

The teaching materials in question contain texts, suitable for sociology courses among others, on various topics such as air pollution through motor vehicles, water pollution, waste packaging material, and also on noise at the workplace and elsewhere.[47] The author begins by describing personal experiences with noise. A systematic objective analysis of sources of noise, noise measurement, effects of noise on the human being and methods of combating noise then follows. There are also graphic illustrations for teachers and students. In the subsequent advice on teaching methods, the meaning of concern and action orientation is explained. Then there is a course outline for several periods of teaching. This contains suggestions for assessing and measuring the noise made by machinery in the school workshop, for evaluating video films and information sheets, for experiments with a noise cassette during classroom work, and for surveys in industries and trade associations.

While these teaching materials were undergoing a testing phase, there were opportunities for participatory observation, notetaking and evaluation talks with teachers. In particular, the use of the noise unit could be examined.[48] Here it was seen that the teachers were interested in technical information to start with, but then considered how their students might be affected and the possibilities of action orientation. These considerations depended very much on the teacher's own commitment and personal experiences with environmental protection. The overall structure of the course outline received less attention: the teachers concentrated more on

suggestions for specific activities, such as the classroom experiment and its evaluation. The fact that they expected positive reactions and active co-operation from the students had something to do with this. In the classroom situation, teaching patterns were geared above all to the students' reactions. These observations indicate the importance of interaction patterns for teachers and students, as these make experience and individual participation possible.

3. Teaching example from general education courses

Two examples from teaching practice in technical colleges should provide an insight into the concrete work done by teachers and students on environmental protection topics. The first example deals with a project week, conducted in the Axel-Bruns School, Technical College 2 in Celle during the 1989/90 academic year.[49]

Various events led up to this project week. Violent rows were breaking out among the students. Massive brawls occurred at a party given by the students' organisation, at break-time there were violent attacks, increasingly aimed at foreign students. The students' organisation, making use of its co-determination rights, decided that this problem should be analysed in the course of a project week, and submitted this proposal to the school governing board for approval.

At the same time a course on environmental protection was being conducted in a basic training class for first year metal workers. This course had been prepared jointly by Hannover University staff members and the teachers of the class in question. Video recordings were shown of an action by Hannover technical college students, in which one could see how they left superfluous packaging behind at a supermarket cashdesk and argued about it with other customers. A card quiz was used to collect key words on environmental problems that the students in Celle thought important and wanted to work on. In a subsequent group project, some of the students composed a letter to the students' organisation, requesting that environmental protection should be included as a topic for the project week.

The project week, which was supported by the school authorities and the teaching faculty was then given the title "Violence and the environment". The students' union published lists of proposals for both topics with sub-topics for working groups. There were four-day projects for full-time students and one-day projects for part-time students. All students and teachers were to take part in a project of their choice. The usual school timetable and class formations were cancelled. On the last day of the week there was an exhibition of group projects.

Many different subtopics were dealt with by the students themselves. One group elaborated a basic plan to convert the school's conventional heating system to gas heating, others devoted their efforts to alternative building, self-defence against violence or the theme of violence in films, comics and music, built a wind generator or laid out a moist biotope in the school grounds. Two group projects merit a brief description.

The Ozone layer project group comprised 15 students from various classes in the basic training year, the training college and the secondary technical school as well as two teachers of metal engineering subjects. Stimulated by newspaper articles on the widening of the hole in the ozone layer over the Antarctic, the group examined and analysed video films, books and other visual material on the problem. They stated the causes, extent and effects of the diminishing ozone in diagrams and cartoons. The final effect was a darkened room in the middle of which a large shimmering coloured globe revolved, to a musical accompaniment, under an ozone gap made of crêpe paper, until the lights gradually came on showing up the diagrams and caricatures on the walls.

The scrap-metal press project comprised 19 students from various vocational, technical and grammar or high-school classes, as well as one teacher of theory and one of practice in the metal engineering occupations. They studied

the recycling of drinks-cans and addressed themselves to the problem of developing devices to reduce the transport volume of such cans. Three sub-groups designed and constructed three different machines to crush the cans; a mechanical rolling press, a mechanically driven cranking press, and a computer-controlled pneumatic press. The presses were presented in action and were later left as visual aids for technical courses.

There can be no doubt as to the enjoyment and commitment of the students in this project work, though it was also noticeable that a small proportion of the students took very little part in it. The school authorities still considered the project week to have been educationally worth while, as students often also "switch off" in classroom lessons. Another question discussed by the teachers was that of the impact. The emotionally loaded representation of the hole in the ozone layer need not necessarily evoke respect for the environment; the building of a scrap metal press might just be an expression of technical interest. The students were asked to consider possibilities of concrete action in the school, which led, for example, to cans and plastic mugs for cocoa and coffee being banned from the cafeteria.

4. Teaching example from job-related training courses

The last example deals with the treatment of the topic Roof-greening. This is a sophisticated craft technique, in which a special multi-layered roofing insulation is laid down and covered with plants. There are various systems. Design and execution involve the skilled occupations of construction draughtsman/woman, gardener and roofer. Roofs with greenery are still frequently looked at askance by the public and the experts, but they are still being built. Although they are not mentioned in the KMK general curricula, they certainly come within the scope of technical training in construction.

However, "roof-greening" has more than just its technical side; it is also an expression of an opposition movement in the face of the destruction of vegetation through urban building. Its ecological advantages are that it tempers the climate, stores water, improves the air, absorbs noise, provides a wildlife habitat and a place to relax.

The Nienburg vocational school[50] devoted several teaching hours to the subject of roof-greening in the 1991/92 academic year, involving two different classes.[51]

One roofing class used slides, transparencies and brochures from the relevant manufacturers of building materials to work out construction layout, choice of building materials and craft techniques in a realistic assignment. This method of procedure took into account the technical motivation of the students. On the basis of these solid technical principles, the students then developed an interest in studying the ecological advantages of roof-greening, and also in solving structural problems and difficulties in respect of building regulations. This also involved sociology classes.

Two teaching periods were conducted with a class of budding construction draughtsmen/women, whose course include the drawing of roof constructions. The students jointly designed a green roof, which was to be constructed in the basic training year for construction technicians. The draughtsmen/women added their own special knowledge to the drawing of construction details, while the roofers contributed their specific technical construction skills. Both student groups set up their "greened" test area in the school grounds, so as to be able to observe the subsequent growth of the roof vegetation.

The interdisciplinary approach to one topic and the co-operation with another class was well received by the students and had a positive influence on the teaching.

C. Special Indications

It will surely be noted that, in these two examples from teaching practice, both job-related and general aspects of the environment topic in question were dealt with, although they involved different subject areas. This is evidence of the tendency in the technical colleges to link vocational and general education across subject area divisions. This is particularly important in job-related environmental training, as environmental problems result from a complex of various causes and situations and must be resolved within that complex.

Environmental training is provided not only in project weeks but also in smaller teaching projects in technical classes. However, there is an effort to find links between the various disciplines. Besides, we can see from the examples described above how co-operation between different teachers, students and persons from institutions outside the school can stimulate job-related environmental training.

VI. Environmental training in further training for teachers

State-organised further training for teachers is intended to qualify teachers to deal with topics of current concern. We shall examine the example of Lower Saxony with its endeavours to qualify vocational school teachers in environmental training. According to available studies from other Länder,[52] Lower Saxony is fairly typical of developments in Germany.

A. Recommendation of the education authorities

The demand that environmental training should be more firmly enshrined in the general and vocational education system and promoted through specific further training schemes for teachers was first advanced in 1980. The Permanent Conference of Ministers of Education of the German Federal Länder (KMK) on 17.10.1980 published a "Statement concerning the functions of the school in the field of environmental training" which ended with the sentence: "The Ministers of Education and the Arts ... undertake to see to the implementation of these educational principles and objectives of environmental awareness and environmental protection and to their inclusion in further training for teachers".[53]

This clearly indicates that further or advanced training, as well as basic training for teachers, is to be an important factor in the promotion of environmental training. A year later, Lower Saxony incorporated this statement into the law of the Land. Other Länder followed suit, some of them considerably later. The "Niedersächsische Landesinstitut für Leherfortweiterbildung und Unterrichtsforschung" (NLI - Lower Saxon Institute for teacher training and educational research), founded in Lower Saxony in 1979, is responsible for implementing this statement in the form of concrete training programmes. Lower Saxony thus followed the example of other Federal Länder in having a central co-ordinating institution for all further training for teachers. The fact that it is reserved for the further training of state teachers is legitimate, as the private training establishments, while they play a major role in providing training programmes in all manner of environmental skills, can scarcely be attended by vocational school teachers under the terms of their service. This situation has begun to change in the past year or so. An increasing number of courses are being conducted specifically for vocational schools in collaboration with Lower Saxon environmental training establishments. The principle that "Teachers teach teachers" is no longer applied quite so exclusively.

There has been one exception to the state-organised further training of vocational school teachers in Lower Saxony since 1979: the Betriebspraktikum or practical training in industry. Teachers may avail themselves of this training opportunity for four weeks every two years. Here too there has recently been a demand that the firms involved should also be investigated in respect of environmental protection and occupational safety.

The regulations concerning the duration of further teacher training are varied. The two major documents on educational planning in the Federal Republic of Germany give the following details:

- the German Educational Council's structural plan, 1970: 5 per cent of the period of service to be reserved for further training, i.e. about two weeks per year.
- Overall Educational plan of the Federal and Land Committee for Educational Planning, 1973: 6 weeks in five years of service to be spent on further training, i.e. at least one week per year.

- Other requirements go even further, on the basis of the formula "initial training = further training", which works out at about four weeks a year.

Further training for teachers often has a thematic emphasis, is "project-oriented". Environmental training is the main emphasis in many further training programmes. From this it can be inferred that, for a limited period at least, courses of at least one week per year would have to be made available to all teachers in vocational schools. It remains to be seen to what extent this is really the case.

Standard ideas on the didactic and methodological quality of teaching in this field[54] are also reflected in the quality required of the further training courses.[55] Unless teachers find out for themselves, during their own further training, that action-orientation, experiential learning, systems orientation or practical training are viable and valid ways of learning, then they will keep to their old teaching methods. And those methods are not very appropriate in environmental training. According to one survey, these didactic criteria are taken into account in no more than 15 per cent of environmental training courses.[56]

B. Case examples: environmental training in further teacher-training in Lower Saxony

1. Twelve years of further teacher-training in Lower Saxony: New technologies versus environmental training?

Here, unlike the other examples, particular attention is given to the organisational planning and the actual process of qualification through further teacher-training. This is relevant, bearing in mind the interesting possibilities of comparison arising from the rivalry between "environmental protection" and "new technologies" as main topics of further training.

A brief comparison between these two qualification processes through further teacher-training suggests itself:

- There has been a massive demand for such measures since the early eighties.
- In subsequent years they were implemented to varying degrees from both the politico-educational and administrative point of view.
- The example "New Technology and (Vocational) School" (Neue Technologien und (Berufs-)Schule - NTB) shows what is possible provided that the political will is there.

a. Politico-educational development of the NTB programme

In 1983 , the Lower Saxon Ministry of Education created the project group "Neue Technologien und Schule" (New technologies and the school). It organised a large technical conference with talks given by experts (four other such conferences were held in the following few years). It developed an organisational concept for the introduction of new technologies in schools and for the qualification of teachers, in order to counter the growing threat of "technological illiteracy". Direct reference was made to the ILO, which had described the lack of qualified persons as the "Achilles' heel of microelectronics".

Qualifications proceeded at three levels:

- First, the Teachers' Commission developed teaching materials. By the end of 1984 nine volumes were available for testing. More were to follow.
- As an innovative measure, the Federal and Land Commission for Educational Planning was requested to authorise a number of pilot projects. Seven of these were being conducted in vocational schools in 1985.
- Further teacher-training was systematically developed into a well-structured overall concept.

The third level - further teacher-training - began around 1984 with an increasing number of central further training courses, organised by the NLI and lasting one week. Their pur-

pose, apart from providing introductory courses, was to qualify "multipliers" and course leaders for the planned regional further training courses (1986 and 1987: about 200 each). At considerable expense, five regional computer centres (RCC) were installed for vocational schools. At the same time, schools began to be equipped with computers. The target for 1984: at least 1/3 of the 72,000 or so teachers in Lower Saxony (including 11,000 or so in vocational schools) were to acquire the technical competence to teach the new technologies. This was the major training policy initiative of the eighties.

Since about 1987, the regional further teacher-training programme in the RCCs has been functioning on a broad basis. With the help of comprehensive training materials, a series of courses, graded as to content and time-span, has been developed for each occupational field. The trend is gradually moving away from general basic training in information technology towards job-related applications. This is supported by the objectives of the new training regulations for the metal and electrical engineering occupations.

By 1990 about half the teachers in vocational schools had been trained in new technologies. New political orientations and an increasing market saturation led to a decline in the number of courses after 1990. The project is gradually coming to an end. What was provisionally to be the last stage began in 1990 with the special programme "Further training for new technologies in vocational schools". Within the framework of the third level of the Lower Saxon further education scheme, internal or in-service further education, the training is completed locally, at the teacher's place of work. Trainers from industry can now take part in it for the first time.

b. Politico-educational development of the environmental training programme

The qualification of teachers for environmental training took a completely different course. The earlier-quoted appeal of the Minister of Education in 1981 for more further education for teachers in this field also applied here, but very little was done for vocational schools until 1989 or so. No comprehensive projects were developed and no specific teaching materials produced. The number of further education courses intended specifically for teachers in vocational schools varied between zero and three per year. About ten courses are available, if one counts the courses for "all types of school" and for secondary levels 1 and 2, which appear suitable for teachers in vocational schools. Virtually all activities apply only to the general education system, although environmental protection has been a central theme of further education for teachers since 1984. The Lower Saxon Minister of Education: A necessary requirement for this function, however, is that the course teachers also receive concrete assistance for the implementation of these objectives in their actual teaching. An announcement from the Ministry of Education: "Environmental training must enable the student to make a critical analysis of his natural, technical, economic and socio-political environment. Learning situations should be such that they reveal complex interrelations. Greater provision should, therefore, be made in the future for education courses on environmental training, that will .. include .. first-hand confrontation and guidance for action (e.g. projects, case studies, surveys..).[57]

The year 1989 saw the beginnings of a comprehensive programme of centralised courses to train teams of course leaders for the project "Local environmental training", which was once again intended only for schools providing general education. Even in-service further education in environmental training for teachers in vocational schools was to be neglected. Between 1986 and 1991 only six teachers' conferences took place, in which there was even a mention of environmental issues.

It was not until 1991 that a change came about in this bleak situation. After the change in Government in the summer of 1990, a new tone was set in educational policy, and this had its effect on the subjects to be emphasised in the further education of teachers. The relevant

passage in the Coalition Agreement reads: "15. Further training and education for teachers: Further training for teachers should concern itself primarily with questions of "internal school reform" e.g., problems of co-education, environmental training, status of teachers in vocational schools ... The undue predominance of courses in new technologies is to be reduced."[58] There was also a shift in priorities in the further education programme for teachers. The preface to the 1992 programme reads: "Further training opportunities in environmental training have been significantly increased .. These serious problems require a restructuring of both school and teaching content. This government is particularly concerned to support teachers in this task".[59]

Target area 1 is "environmental protection", "new technology" takes 8th place on the list and, in between, at 4th place "reclassification of occupations/New courses in vocational education". For the first time in 1991, vocational schools were explicitly mentioned in connection with "environmental training": "Of especial importance to vocational training schools are the courses on "Job-related environmental training in the occupational field..."[60]

Since 1992, this change in political will has been reflected in the increasing number of courses on offer. Environmental training has been integrated into other more technically-oriented further training courses. This is an obvious approach, but a new departure as regards the courses offered. The following course announcement is typical:

Questions of teaching methodology in the use of selected material in courses for painting and varnishing classes

integrative approach to the material "stripping paint from a façade"

student-centred and action-oriented use of the material in the classroom

integrative teaching of job-related environmental training in the classroom.

Seven additional courses of this new type were made available in 1992. However, they have so far been limited to the occupational fields of construction engineering and interior design. It is also noticeable that, in 1992, for the first time, courses were offered in which job-related environmental training and new technologies were linked together.

c. Job-related environmental training and new technologies: a quantitative comparison

What is the quantitative status of these two rival further education programmes in Lower Saxony to qualify teachers in vocational training schools? - Precise figures are difficult to obtain. When evaluating the course programmes, it is important to take into account, among other things, that the courses given at the regional computer centres are generally shorter than the centralised week-long programmes. It must also be remembered that some courses are dropped, but that additional courses, not originally included in the programme, are also offered. The diagram below is therefore only a rough outline.

Number of further education courses Vocational training schools in Lower Saxony

This diagram does not take into account the number of courses that may also be suitable

for vocational schools, e.g. those that come under the category "all types of school". It is difficult to assess how many vocational school teachers attend these. Some 3,500 courses have been provided over a period of 11 years. If one reckons with the optimistic figure of 20 participants per course, then, statistically, some 11,000 teachers will have had a chance of participating in 0.6 courses per year, i.e. they could attend a one-week course every two years or so.

We have recorded the number of courses intended solely for teachers at vocational training schools: some 1,600 courses in 11 years; these include

- the number of central and regional courses in New Technologies for vocational schools: about 700 one-week courses in 11 years
- the number of courses in Environmental Training in vocational schools: approx. 40 courses in 11 years.

This works out at a possibility of attending such a course once in 150 years! If we include the environmental training courses which are provided for all types of school, and which appear suitable for vocational schools, the number increases to 130 courses, i.e. the possibility of obtaining further education goes up to one course every 45 years which is more than the normal length of service.

Conclusion: Unlike the situation applying in the case of new technologies, there is as yet no genuine possibility for vocational school teachers to obtain a qualification in environmental training. The state-run further education programmes (in Lower Saxony) have fallen far short of the demands of the politicians. There is still no recognisable political concept of qualification. We can only hope that present trends will continue progressively. After all, almost as many courses were offered in 1992 as in the ten preceding years.

Teachers at vocational schools are therefore obliged to organise their qualification as environmental trainers to a large extent on their own. It is due solely to the commitment of the few that job-related environmental training is still being carried out at all.

2. Further training for teachers in environmental training: two course examples

The Working Group on Environmental Training and Vocational Training at the University of Hannover Institute for Vocational Teacher Training has conducted approximately ten courses as part of the state-run teachers' further education programme. We shall briefly describe two courses, each with a different organisational structure.

a. Central further education course: "environmental training in vocational training schools: Case study: Wind-power plants

This course was attended by 24 teachers from vocational training schools in the spring of 1992. The participants were mainly teachers in the occupational fields of metal and electrical engineering. The course lasted one week. This topic was chosen because the subject of "renewable forms of energy supply" is listed in certain guidelines as a learning objective, because the venue was located near the coast and there are wind-power plants in operation in the surrounding area. This type of energy production is enjoying a boom in Germany at the moment as a result of new promotion programmes.

Course plan:

1st day:

On individual cards, the participants note down their interests in the course methodology and in the topic. The cards are sorted out, pasted onto large sheets of paper and attached to the walls. The original course plan is modified in a few places. The case example to be examined is explained in greater detail. Then the case study is examined more closely under the aspect of teaching methodology. Experts, provide exhaustive technical information on the topic of wind energy, as does a vocational school teacher. (A week before the start of the course, the participants were given a comprehensive reader with informational material).

2nd day:

People to be interviewed are proposed: wind power plant operators; farmers, educational establishments; a wind-power plant manufacturer, the local planning authority etc. The participants choose people who interest them in particular. Six small groups are formed. They decide on the objectives of their survey and the form in which they will present their findings. The individual groups undertake interviews. They evaluate their findings systematically and prepare their presentation, devising scenarios, making a video, painting illustrations.

3rd day:

Participants meet in full assembly. As creatively as possible, each group presents major findings on the case example. Time is also allocated for discussion.

4th day:

Individual findings are correlated; the evaluation phase begins. The participants familiarise themselves with the different instruments for producing a graphic representation of correlations within systems: the "map" showing the correlation networks, the "paper computer"[61] for describing the interactions between the individual system elements. The individual groups thus consolidate their study of the system of "renewable energy production and consumption".

5th day:

The following questions are discussed: What practical lessons can be drawn from this course as regards your teaching work? Does working on case studies encourage associative thinking, action-oriented learning? What examples spring to mind in your own occupational field? What developments have been observed so far?

In-service further training for teachers: "Environmental training in vocational training schools: Refuse at our school"

A technical vocational school organised a teachers' symposium for the entire faculty (approx. 100 persons). One working group wanted to deal with environmental protection. We were asked to lead this group and to propose a programme. We held some preliminary talks, decided on the topic and discussed a plan of action. The group comprised some 15 teachers from various occupational fields.

Course programme

1st day:

The group leaders proposed two topics by way of introduction: a) "Environmental protection in the classroom - by which I hope to ...." To provide an overall picture, the statements were written on cards. Each person could fill out as many cards as he/she wished and stick them up on the wall. b) "environmental training in the classroom - by which I hope to ...."

Pairs of participants drew up a picture in free graphic form. The ensuing discussion illustrated the gap between the principle and the reality. On this basis, the participants developed ecological guidelines for their own teaching. These were to be actively tested in the context of the refuse problem at their own schools. A system of "refuse production - refuse avoidance - refuse disposal" was analysed and graphically illustrated on large sheets of wrapping-paper. Major producers of refuse were the cafeteria and the automatic drinks dispenser. To what extent could the teaching staff influence the range of goods on sale? Who was responsible for changes? - A survey should produce indicators for a change in behaviour patterns. The survey objectives were decided upon.

2nd Day

Without prior notice the participants went in small groups to visit the competent authorities: the municipal cleansing department, the school governing body, the caretaker; the kiosk lady, the container service, the neighbouring school, the aluminium recycling plant.

They learned some amazing facts. The teachers were unaware of certain statutory regulations. They did not know what other schools had already achieved. In fact, the teachers had greater possibilities of bringing influence to bear than they had suspected, it was a question of knowing the ropes. "There is nothing we can do about it" - no, that is not true, you can do a great deal if you want to. The participants discussed the next steps to be taken, they talked to the school principal and formulated motions for the general staff conference. And how were the students to be involved? - that was to be discussed at the end.

C. Development trends

The trends described on the occasion of the introduction of New Technologies seem to be repeating themselves in the case of Environmental Training - 12 years later. From the organisational point of view, qualification opportunities are being moved from centralised courses to regional and local further teacher-training. What started about three years ago in schools providing general education is also emerging in the vocational training schools. Unlike the centralised courses, the regional courses are organised by the regional governments. This administrative level is only slowly beginning to develop capacity for advising vocational schools, e.g. by appointing "Environmental consultants for schools". Local and regional environmental training projects are to a large extent initiated by committed teachers - in response to the needs and dissatisfactions expressed in the area. This is the case, for example, for the working group on "Environmental Studies in Vocational Training", in which 15 vocational schools and other institutions in East Friesland participate. While the project is tolerated by the regional government, it is subsidised by the "Cultural and Educational Centre" of the "Ostfriesische Landschaft". Further teacher training is being increasingly organised by other institutions, by teachers associations, trade unions and environmental educational associations.

The objectives of the Working Group provide a good example to describe the present development trend as regards subject area and teaching content. The formerly predominating general themes of environmental training have been dealt with fairly exhaustively and a certain degree of technical competence has been attained. On the other hand, there is an urgent need to combine technical occupational skills with environmental training in concrete projects and to test them with the students. Thus the working Group on "Environmental Studies in Vocational Training" has developed a scheme to redesign vocational training schools as "ecological learning centres". The ecological conditions of the students' own school become the focus of attention. From the efficiency of the heating system and the piles of refuse generated by the school kiosk to the solvents used in the school's paintshop: professional methods are used in the attempt to control and change the long-neglected ecologically relevant areas of the students' own occupational field. There are already a number of examples in Lower Saxony of this training "from below", on the students' own initiative, supported but not primarily organised by the government.

At institutional level too, increased efforts are being made. Technical schools are becoming industrial establishments. Trade associations, in their capacity as authorities responsible for occupational health and safety and industrial environment protection, are increasingly insistent that vocational schools should also comply with statutory regulations, e.g. the Ordinance on Hazardous Substances. This Ordinance, which came into effect on 1.1.1988, places students and teachers in the same category as employees in industrial establishments. There is a growing demand on the part of the responsible institutions for qualified personnel. "Function stations" will have to be set up in the schools to carry out the statutory regulations. Infringements of these regulations constitute a punishable offence; teachers do not feel competent to assume these new responsibilities and are themselves demanding to be trained , e.g. as "safety delegate in vocational schools".

VII. Prospects

As the examples have shown, a number of activities, at both political and practical educational level have been undertaken with a view to integrating environmental protection into vocational training and retraining. But this is only a beginning, and further efforts will be needed to establish the idea of environmental protection firmly in people's minds. In this section, we shall examine perspectives for the further development of this field, on the basis of the current debate on job-related environmental training and our own experiences.

A. On-the-job training and further training of training personnel

The fact that environmental protection is to be taken into consideration in a job-related context in future training regulations[62] certainly constitutes an important step towards the creation of the necessary conditions for environmental studies as part of vocational training. The topic evokes a reflex action, in as much as its significance has been explicitly emphasised by Federal and regional authorities, employers and employees. On the other hand, the desired effects are only likely to be perceived in training practice in the long term, as the recommendations must first be established as legally binding in the training institutions, and this requires a tedious process of reorganisation or revision of training regulations. There is also a need for further co-ordinated measures to improve the general condition of training-related environment studies.

We consider the following aspects to be of particular significance:

Training regulations must be revised in principle to take environmental aspects into account. The most important elements of such a revision can be found in the supplementary recommendations of the BIBB Central Commission.[63] Above and beyond these recommendations, it should be found out whether the present training content is still valid in the context of preventive environmental protection, whether it should be extended or, if necessary, revised.

Training personnel must be qualified in advance for this new area of responsibility. Environmental protection must be an integral component in the training of trainers. This has so far not been the case. The relevant examination syllabuses and preparatory courses must therefore be revised.

The further training of training personnel must be conceptually and organisationally adapted to the topic and the career situation. A graduate programme, such as that developed by the University of Hannover Working Group on Environmental Protection and Vocational Training, would appear to be a suitable model.[64] The integration of transfer exercises into interdependent and cumulative further training programmes can contribute to their implementation in training practice. From the organisational point of view, working groups are an alternative to the traditional form of further training in seminars, because of their greater flexibility as to time and their closer links with problems and/or applications.

The integration of environmental protection into intermediate and final examinations requires the development of examination questions and the training of qualified examiners. Examination questions could be developed as part of the relevant qualification programmes, on the basis of explicit and implicit environmental protection references in the training regulations and of successful practical experiences in the integration of environmental protection in vocational training.

Training needs to be supported by suitable teaching and learning aids. This need is being constantly pointed out by teachers involved in vocational training. On the other hand, since a great deal of material has been developed in the meantime, it will not be necessary to develop new training material in every case. Therefore, the first thing to do is to collect existing materials systematically, examine them critically and, where necessary complete or update them and make them available to teachers for practical training purposes.

Environmental protection measures in the training department and environmental protection measures in the rest of the establishment are to be regarded in the context of their interaction. Thus, as environmental protection measures in the establishment might be expected to become an integral component of on-the-job training, it should also be ensured that environmental protection activities developed in the training department are also introduced into the rest of the establishment. This calls for the development of establishment-related concepts, which involve the personnel, organisational and technical aspects of the establishment associated with the training.

Co-operation between the vocational school and the training establishment is essential. Activities designed to promote the integration of environmental protection into vocational training take place - if at all - separately, in the establishment and in the vocational school. Local working groups comprising trainers and vocational school teachers should be formed and should meet regularly to co-ordinate course content.

B. Vocational school and further training for teachers

The object of the current debate is, to some extent, to improve teaching curricula in this field also. However, efforts are primarily being concentrated on changing teaching methods and training organisation.

For environmental studies, this means a liberalization of teaching both within and outside the school:

General and job-related aspects of environmental studies should be taught integratively. The ecological interrelations between material cycles and economic structures and the possibilities for concrete action on the part of individuals in their day-to-day consumption and working behaviour are already being taught in various subjects in the schools; however they should form an indivisible whole in the students' consciousness. Teachers therefore need a certain latitude in their curricula and teaching organisation, as well as greater ability to work as a team.

The ecologically important learning and action possibilities of the students should be organised in a more concrete fashion. This can be brought about by opening up the school to co-operation with outside institutions dealing with environmental problems (local governments, industries, environmentalist organisations).

The traditional isolation of the student should be broken down. Ideas are being discussed with regard to sponsorships and projects in cooperation with other schools at home and abroad, which would encourage the creation of networks for environmental project work.

The school "plant" should be increasingly regarded and used as a field of ecological study. Like any other industrial plant vocational school centres with their workshops need to be carefully analysed and reorganised with regard to environmental protection. The students should be involved in this.

Vocational schools should create posts with special functions, for which teachers should be specially qualified. The statutory regulations in respect of occupational health and safety and environmental protection are increasingly placing vocational schools in the same category as industrial establishments. This increases the demand for qualified school principals and teaching staff. Teachers are

demanding opportunities to qualify for these new types of job, e.g. "Delegate for occupational health and safety and environmental protection".

In respect of further training for teachers, courses on the integration of environment protection into job-related teaching content should be further promoted. Multipliers should be trained for this. Up to the present, courses with general, comprehensive environmental training themes have tended to predominate. A certain saturation level seems to have been reached. Teachers want to combine their existing expert technical knowledge with a proficiency in environmental protection. Job content is thus broadened.

Teaching methods used with success in environmental training are being increasingly incorporated into course methodology. Up to the present, concrete, active learning and integrated systematic learning and thinking have played a secondary role in further training courses. The teaching of new ideas and techniques was all too often theoretical only. The resulting deficiencies in teaching methods are to be remedied through the use of a different methodology: case studies, project work, research projects, promotion of team work and a more open approach to educational work.

Centralised further training courses are replaced by regional and local activities. The initiatives of the teachers on the spot should be encouraged and supported. Specific environmental problems in schools or the workplace are increasingly attracting public attention. Regional "curricular centres" and local working groups should support projects to solve these problems. This implies co-operation with other environmentalist institutions and educational establishments - a co-operation which has long been neglected.

Notes

1. Bundesregierung: *Umweltpolitik. Das Umweltprogramm der Bundesregierung* (Stuttgart 1971).

2. Bundesminister für Bildung und Wissenschaft: *Zukunftsaufgabe Umweltbildung. Stand und Perspektiven der Umweltbildung in der Bundesrepublik Deutschland.* Series BILDUNG - WISSENSCHAFT - AKTUELL 3/91. (Bonn 1991).

3. Information supplied by Mr. Kutt, Federal Institute for Vocational Training.

4. Bundesminister für Bildung und Wissenschaft: *Berufsbildungsbericht 1992.* Schriftenreihe Grundlagen und Perspektiven für Bildung und Wissenschaft, 31. (Bonn 1992).

5. Schlussericht der Enquete-Kommission "Zukünftige Bildungspolitik - Bildung 2000". Deutscher Bundestag. Drucksache 11/7820 vom 05.09.1990.

6. Schutz der Erdatmosphäre - eine Herausforderung an die Bildung. Zur Umsetzung der Empfehlungen der Bundestags-Enquete-Kommission "Vorsorge zum Schutz der Erdatmosphäre in das Bildungssystem". Ergebnisbericht (Bonn 1990).

7. According to Stothfang, E. 1988 and Kayser, B. 1989.

8. K. Lieberam: "Überlegungen und Erfahrungen bei der Entwicklung von Unterrichtsmaterialien im Rahmen des Forschungsvorhabens Umwelterziehung am Institut für Berufspädagogik der Universität Hannover", in: Arbeitsgruppe des Instituts für Berufspädagogik der Universität Hannover: *Hochschultage Berufliche Bildung '84. Ökologische Aspekte in der Berufsausbildung. Beiträge zum Workshop.* (Berlin) 1984.

9. Industriegewerkschaft Metall: *Anlagenmechaniker, Anlagenmechanikerin. Neuordnung der industriellen Metallberufe.* Arbeitshilfe 5. (Düsseldorf, Hans-Böckler-Stiftung 1987).

10. An exception is the new classification of occupations in the chemical industry, in which the environmental relevance of certain training subjects and the corresponding learning objectives are specifically stated.

11. M. Ehrke: Lernziel: "Umweltschutz. Positionen, Forderungen und Aktivitäten der IG Metall", in *Gewerkschaftliche Bildungspolitik* 11/1991, pp. 245-250.

12. "Umweltschutz in der beruflichen Bildung. Ergänzende Empfehlungen des Hauptausschusses des Bundesinstituts für Berufsbildung vom 1. Februar 1991 zur Einbeziehung von Fragen des Umweltschutzes in die berufliche Bildung", in: *Berufsbildung in Wissenschaft und Praxis* Nr. 3/1991.

13. K. Mutz: Umweltschutz und Ausbilder. in: *Der Ausbilder* 37 (1989), Nr. 4, pp. 64-67

14. C. Kreklau: "Umweltschutz - Qualifikationsbedarf aus Sicht der Arbeitgeberorganisationen", in: *Neu: Umweltschutz - Qualifikationsbedarf und Qualifizierung.* BIBB Kongre und aktuelle Informationen. (Bundesinstitut für Berufsbildung, Der Genralsekretär) Berlin 1989, pp. 13-18.

15. Asea Brown Boveri AG: *IFAS. Integrierte Vermittlung von Fach- und Schlüsselqualifikationen durch Leittexte in der Berufsausbildung* . Draft of a BBC concept. Third revised edition. (Mannheim 1988) and *IFAS - was ist das? Eine Information über eine neue Ausbildungsmethode.* Mannheim undated.

16. Asea Brown Boveri AG: *Die Zukunft der qualifizierten.* Ausbildung und Fortbildung bei ABB. (Mannheim 1990).

17. Asea Brown Boveri AG: *Energie und Umwelt. Basisunterweisung für gewerblich-technische Auszubildende der ABB.* Ausbilder-Handbuch. Mannheim undated.

18. Ibid.

19. Ibid.

20. Ibid.

21. This was produced by a team from the further training programme developed and tested by the Hannover University Working Group on Environment Protection and Vocational Training.

22. Stadtwerke Hannover AG: *Mitarbeiter-Information* (Hannover 1991).

23. Idem.

24. This was also produced by a team from the further training programme developed and tested by the Hannover University Working Group on Environmental Protection and Vocational Training.

25. Schlussericht der Enquete-Kommission ... Op. cit.

26. Ch. Nitschke: *Umweltlernen in der Berufsbildung und der beruflichen Weiterbildung. Gutachten für die Enquete-Kommission "Zukünftige Bildungspolitik - Bildung 2000".* (Bonn, Ausschau für Bildung und Wissenschaft des Deutschen Bundestages, 1991).

27. B. Bonhaus: *Qualifizierung des Ausbildungspersonals für den Umweltschutz - Erarbeitung eines Überblicks über bestehende Qualifizierungsmanahmen* (Hildesheim 1990).

28. K. Kutt: *Modellversuche - Umweltschutz in der beruflichen Bildung.* Unpublished manuscript. (Berlin 1992).

29. Bundesinstitut für Berufsbildung, Der Generalsekretär: *Umweltschutz in der beruflichen Bildung 1: Qualifizierung des Ausbildungspersonals.* Informationen zur Ausbildungspraxis aus Modellversuchen (Berlin 1989).

30. B. Bonhaus; M. Hilgers; K-D. Mertineit: *Umweltschutz in der Berufsausbildung. Ein berufsübergreifendes Grundseminar zur Qualifizierung des betrieblichen Ausbildungspersonals im Umweltschutz* (Seelze 1992).

31. Berufsausbilderverband Baden-Württemberg, Bezirk Schwarzwald-Baar-Heuberg: "Umweltschutz und Berufsausbildung" in *Der Deutsche Berufsausbilder* 2/1990. p. 14f

32. B. Bonhaus; A. Güntzel: "Lernortkooperation am Beispiel "Hauswirtschaft und Ökologie", in *Berufsbildung* 46 (1992), Nr. 2, pp. 95-98.

33. Arbeitsgruppe Umweltschutz und Berufsbildung am Institut für Berufspädagogik der Universität Hannover in Zusammenarbeit mit dem BIBB: *Protokoll eines Multiplikatorenseminars "Wie gestalte ich ein berufsübergreifendes Einführungsseminar zur Qualifizierung betrieblicher Ausbilder für den Umweltschutz?"* Umweltschutz in der beruflichen Bildung. Informationen und Materialien aus Modellversuchen. Heft 7, (Bundesinsitut für Berufsbildung, Der Generalsekretär, Berlin 1991).

34. M. Hilgers; K-D. Mertineit: "Erste Erfahrungen mit einem mehrstufigen Konzept zur Qualifizierung des Ausbildungspersonals im Umweltschutz" in: *Gewerkschaftliche Bildungspolitik* 11/1991, pp. 267-271

35. Die bfw-Gesellschaften: *Informationen zum Geschäftsjahr 1991,* (Düsseldorf, Berlin undated).

36. Berufsfortbildungswerk Gemeinnützige Bildungseinrichtung des DGB GmbH (bfw), Berufspädagogische Arbeitsstelle der Hauptverwaltung (BAS) (Ed.): *Interne Weiterbildung des bfw. Programm 92/93.* (Erkrath 1992)

37. Berufsfortbildungswerk Gemeinnützige Bildungseinrichtung des DGB GmbH (bfw), Berufspädagogische Arbeitsstelle der Hauptverwaltung (BAS) (Hrsg.): *Materialien zum Umweltschutz.* (Erkrath 1992)

38. Statement by Mr. Schmitz, Training and Further Training Department.

39. Ständige Konferenz der Kultusminister der Länder in der Bundesrepublik Deutschland: *Beschlüsse der Kultusministerkonferenz - Berufliche Bildung.* (Stand 1991).

40. Ch. Nitschke: *Umweltlernen* ... op. cit.

41. Ständige Konferenz der Kultusminister der Länder in der Bundesrepublik Deutschland: *Umwelterziehung in der Schule. Bericht der Kultusministerkonferenz vom 12.12.1986* (Bonn 1987).

42. Der Niedersächsische Kultusminister: *Arbeitsergebnisse der Kommission für das Fach Gemeinschaftskunde* (Hannover 1983).

43. Ständige Konferenz der Kultusminister der Länder der Bundesrepublik Deutschland: *Rahmenvereinbarung über die Berufsschule. Beschlu der Kultusministerkonfenz vom 14./15.03.1991.* (Bonn 1991).

44. Idem.

45. Der Niedersächsische Kultusminister: *Richtlinien für den berufsfeldbezogenen Lernbereich im Berufsgrundbildungsjahr Bautechnik* (Hannover 1988).

46. UNESCO-Verbindungsstelle für Umwelterziehung beim Umweltbundesamt: *Unterrichtsmaterialien zum Thema Ökologie/Umweltschutz für den Sozialkundeunterricht an berufsbildenden Schulen,* (Berlin 1986).

47. Ch. Mayer: *Unterrichtsmaterialien im Berufsschulalltag.* (Frankfurt a.M., New York 1988). pp. 191-313.

48. The event took place with the approval of the school principal, Mr. Henning, and Mr. Suckow and Mr. Hartwig as participating teachers.

49. J. V. Techer: Site engineering.

50. Gewerkschaft Erziehung und Wissenschaft - Landesverband Niedersachsen (pub.): *GEW-Infomarkt Berufliche Umweltbildung,* (Hannover 1992), pp. 96-100.

51. R. Hedtke: *Zwischen ökonomischer und ökologischer Modernisierung. Zur Analyse staatlicher Lehrerfortbildungsangebote in Nordrhein-Westfalen,* (Universität Bielefeld, Zentrum für Lehrerbildung 1992).

52. Bundesminister für Bildung und Wissenschaft ... op. cit.

53. Ch. Nitschke: *Umweltlernen* ... op. cit.

54. UNESCO-Verbindungsstelle ... op. cit.

55. G. Eulefeld, u.a.: *Praxis der Umwelterziehung in der Bundesrepublik Deutschland,* (Kiel 1988).

56. Information from the Lower Saxon Ministry of Education 1984, pp. 208f.

57. Landesverband Niedersachsen der Sozialdemokratischen Partei und der Landesverband Die Grünen von Niedersachsen: *Koalitionsvertrag zwischen SPD und Die Grünen.* (Hannover 1990).

58. Niedersächsisches Landesinstitut für Lehrerfortbildung, Lehrerweiterbildung und Unterrichtsforschung: *NLI-Programm 1991-2.* (Hildesheim 1991), p. 3.

59. Bundesminister für Bildung und Wissenschaft: *Berufsbildungsbericht 1991.* Schriftenreihe Grundlagen und Perspektiven für Bildung und Wissenschaft, 28. (Bonn 1991).

60. F. Vester: *Ballungsgebiete in der Krise.* New edition. (Munich 1991).

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